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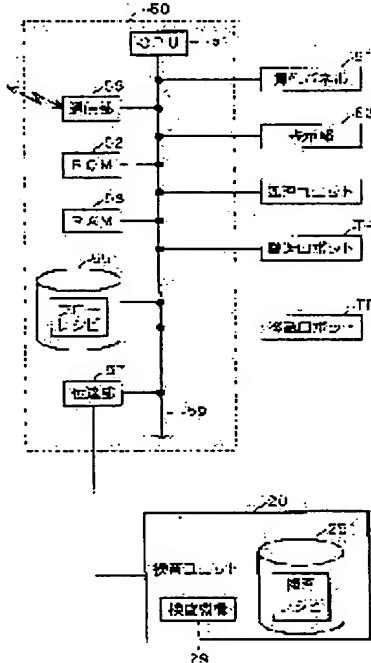
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(54) SUBSTRATE PROCESSING APPARATUS

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a substrate processing apparatus, capable of readily setting conditions on an inspection of substrates.

SOLUTION: A plurality of inspection recipes are held in a magnetic disc 25 of an inspection unit 20. Different conditions on the inspection are described in each of the plurality of inspection recipes, and a different specific number (recipe number) is attached to each of the plurality of inspection recipes. As to which inspection recipe is used, an operator can select the recipe number, corresponding to any of the plurality of inspection recipes from an operation panel 61, and thus conditions on the inspection in the inspection unit 20 can be designated. The selected recipe number is described in a flow recipe, and transmitted from a transmission part 57 to the inspection unit 20. The inspection unit 20 conducts the inspection, in accordance with the designated inspection recipe.



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CLAIMS

[Claim(s)]

[Claim 1] With the Banking Inspection Department which is the substrate processor which equipped the substrate with the processing section which performs predetermined processing, and conducts predetermined inspection to a substrate The taking-out acquisition stage which carries out taking-out close [of the substrate] to said Banking Inspection Department, and an assignment means to specify the conditions about inspection in said Banking Inspection Department, The substrate processor characterized by having the means of communication which transmits the conditions about the inspection about the substrate concerned specified from said assignment means to said Banking Inspection Department before said taking-out acquisition stage carries in a substrate to said Banking Inspection Department.

[Claim 2] It is the substrate processor which said Banking Inspection Department holds two or more inspection recipes which described the conditions about inspection in a substrate processor according to claim 1, and is characterized by said assignment means specifying the conditions about inspection by choosing either of said two or more inspection recipes.

[Claim 3] It is the substrate processor which a different code is matched with said two or more inspection recipes in a substrate processor according to claim 2, and is characterized by said assignment means specifying the conditions about inspection by choosing the code matched with either of said two or more inspection recipes.

[Claim 4] The code chosen by said assignment means in the substrate processor according to claim 3 is a substrate processor characterized by what is described by the flow recipe which described the procedure of a substrate.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to the substrate processor incorporating the Banking Inspection Department which conducts predetermined inspection, for example, the thickness measurement of a resist etc., to a semi-conductor substrate, the glass substrate for liquid crystal displays, the glass substrate for photo masks, the substrate for optical disks (a "substrate" is only called hereafter), etc.

[0002]

[Description of the Prior Art] As everyone knows, products, such as a semi-conductor and a liquid crystal display, are manufactured by performing a series of processings of washing, resist spreading, exposure, development, etching, formation of an interlayer insulation film, heat treatment, dicing, etc. of many to the above-mentioned substrate. It is important to conduct various inspection of a substrate and to perform quality assurance after the process whose various above-mentioned processings settled, because of quality maintenance, such as this semi-conductor product.

[0003] For example, in the substrate processor (the so-called coater & developer) which performs resist spreading processing and a development, it is made to inspect line breadth measurement of the pattern on a substrate etc. in the final process of a development conventionally. The substrate which serves as a subject of examination at this time is once taken out from a substrate processor, and inspection will be presented after being carried in to the test equipment of the dedication prepared in another location. And the inspection result is fed back to a substrate processor, and adjustment of various processing conditions is performed.

[0004]

[The technique used as a background] However, in the former, since a substrate processor and test equipment were prepared independently, even test equipment had to carry the substrate used as a subject of examination, and the futility of time amount and an effort had arisen. Moreover, processing of the considerable number of a substrate paid out to equipment after the substrate concerned by the time the inspection result about a certain substrate became clear, since a certain amount of time amount was taken for an inspection result to become clear while the carrying-in time amount to test equipment was required was completed. For this reason, when nonconformity was in an inspection result, it will be necessary to perform reprocessing about the substrate of a considerable number, and processing effectiveness was to fall.

[0005] In order to solve such a problem, building test equipment into the interior of a substrate processor is considered. If test equipment is built into the interior of a substrate processor, since a substrate can be conveyed to test equipment with the carrier robot of a substrate processor, useless conveyance time amount can be omitted and an inspection result can be made to become clear to the inside of a short time. Therefore, even if nonconformity is in an inspection result, reprocessing can lessen required substrate number of sheets.

[0006]

[Problem(s) to be Solved by the Invention] However, in the former, two or more recipes which

described the verification condition are given to the test equipment incorporated in the substrate processor, and the recipe switch from a test equipment side is made to perform what kind of inspection is conducted according to what kind of conditions uniquely. That is, apart from setting out of the substrate processing conditions from a substrate processor etc. as an operator, the verification condition of test equipment needed to be set up separately.

[0007] For this reason, while the patient throughput of a substrate fell, there was a problem of being easy to produce a failure etc.

[0008] This invention is made in view of the above-mentioned technical problem, and aims at offering the substrate processor which can set up the conditions about inspection of a substrate easily.

[0009]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, invention of claim 1 With the Banking Inspection Department which is the substrate processor which equipped the substrate with the processing section which performs predetermined processing, and conducts predetermined inspection to a substrate. The taking-out acquisition stage which carries out taking-out close [of the substrate] to said Banking Inspection Department, and an assignment means to specify the conditions about inspection in said Banking Inspection Department, Before said taking-out acquisition stage carries in a substrate to said Banking Inspection Department, it has the means of communication which transmits the conditions about the inspection about the substrate concerned specified from said assignment means to said Banking Inspection Department.

[0010] Moreover, invention of claim 2 makes two or more inspection recipes which described the conditions about inspection hold to said Banking Inspection Department, and is making it specify the conditions about inspection in the substrate processor concerning invention of claim 1 by choosing either of said two or more inspection recipes as said assignment means.

[0011] Moreover, invention of claim 3 is making the conditions about inspection specify it as said two or more inspection recipes in the substrate processor concerning invention of claim 2 by choosing the code which a different code was matched and was matched with said assignment means by either of said two or more inspection recipes.

[0012] Moreover, invention of claim 4 has described the code chosen by said assignment means in the substrate processor concerning invention of claim 3 to the flow recipe which described the procedure of a substrate.

[0013]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail, referring to a drawing.

[0014] Drawing 1 is the perspective view showing the outline of the whole substrate processor concerning this invention. Moreover, drawing 2 is the top view showing the outline configuration of this substrate processor. In addition, the XYZ rectangular coordinate system which makes Z shaft orientations the direction of a vertical in order to clarify those direction relation at drawing 1, drawing 2, and drawing 3, and makes XY flat surface the level surface is attached. This substrate processor is a substrate processor (the so-called coater & developer) which performs resist spreading processing and a development to Substrate W, is divided roughly and constituted by Indexer ID, and the unit arrangement section MP and Interface IFB.

[0015] While Indexer ID is equipped with the transfer robot TF, the inspection units 10 and 20 (Banking Inspection Department), and the installation stage 30, the display 62 is installed in the external wall surface of Indexer ID. Four carriers C can be arranged and laid in the installation stage 30 along a horizontal direction (Y shaft orientations). The receipt slot on multistage is engraved on each carrier C, and one substrate W can be held in a horizontal position in each slot (making a principal plane meet the level surface). Therefore, on each carrier C, where it separated predetermined spacing to a horizontal position and multistage and the laminating of two or more substrates W (for example, 25 sheets) is carried out to them, it can contain. In addition, as a gestalt of Carrier C, you may be any of FOUP (front opening unified pod) which contains Substrate W to a closed space, or OC (open cassette) which puts the receipt substrate W to the open air.

[0016] Drawing 3 is the transfer robot's TF appearance perspective view. The transfer robot TF has realized the multistage embedded structure of a telescopic mold with the flexible object 40 while establishing the arm stage 35 equipped with one transfer arm 75 in the upper part of the flexible object 40.

[0017] The flexible object 40 is constituted by four division objects 40a, 40b, 40c, and 40d sequentially from the top. Division object 40a can be held in division object 40b, division object 40b can be held in division object 40c, and division object 40c can be held in 40d of division objects. And by containing the division objects 40a-40d one by one, it contracts and the flexible object 40 elongates the flexible object 40 by pulling out the division objects 40a-40d one by one conversely. That is, division object 40a is held in division object 40b at the time of contraction of the flexible object 40, division object 40b is held in division object 40c, and division object 40c is held in 40d of division objects. On the other hand, division object 40a is pulled out from division object 40b at the time of extension of the flexible object 40, division object 40b is pulled out from division object 40c, and division object 40c is pulled out from 40d of division objects.

[0018] Flexible actuation of the flexible object 40 is realized by the flexible elevator style prepared in the interior. The device in which what combined two or more belts and rollers is driven by the motor as a flexible elevator style, for example is employable. The transfer robot TF can perform rise-and-fall actuation which met in the direction of a vertical of the transfer arm 75 (Z shaft orientations) by such flexible elevator style.

[0019] Moreover, as shown in drawing 3, the transfer robot's TF conveyance arm 75 can be moved in accordance with Y shaft orientations with a male screw 77 and Y drive which is a drive of Y shaft orientations which consist of guide-rail 76 grade. That is, in accordance with Y shaft orientations, slide migration of the 40d of the division objects screwed in a male screw 77 can be carried out by rotating a male screw 77 with the electric motor outside drawing.

[0020] Furthermore, the transfer robot TF can also perform level attitude migration and revolution actuation of the transfer arm 75. The arm stage 35 is established in the upper part of division object 40a, and, specifically, the arm stage 35 performs level attitude migration and revolution actuation of the transfer arm 75. That is, when the arm stage 35 makes the arm segment of the transfer arm 75 bend and stretch, the transfer arm 75 performs level attitude migration and arm stage 35 the very thing performs revolution actuation to the flexible object 40, the transfer arm 75 performs revolution actuation.

[0021] Therefore, the transfer robot TF can make making horizontal migration carry out in the height direction in accordance with carrying out rise-and-fall actuation and Y shaft orientations, carrying out revolution actuation, and a horizontal direction carry out attitude migration of the transfer arm 75. That is, the transfer robot TF can move the transfer arm 75 in three dimension.

[0022] By actuation of such a transfer robot TF, Indexer ID can receive the substrate [finishing / processing] W from the unit arrangement section MP, and can contain it on Carrier C while it picks out the unsettled substrate W from the carrier C which can contain two or more substrates W and passes it to the unit arrangement section MP. Moreover, Indexer ID performs the taking-out close of the substrate W to the inspection unit 10 and the inspection unit 20 with the transfer robot TF.

[0023] The inspection unit 10 is an inspection unit (macroscopic defect inspection unit) which conducts macroscopic defect inspection. "Macroscopic defect inspection" is the comparatively big defect appeared on Substrate W, for example, inspection which judges the existence of adhesion of particle. On the other hand, the inspection unit 20 is an inspection unit which performs thickness measurement of a resist, line breadth measurement of a pattern, and superposition measurement of a pattern. That is, the inspection unit 20 can conduct three kinds of inspection in one inspection unit. "Thickness measurement of a resist" is inspection which measures the thickness of the resist applied on Substrate W. "Line breadth measurement of a pattern" is inspection which measures the line breadth of the pattern formed on Substrate W of exposure and a development. "Superposition measurement of a pattern" is inspection which measures a gap of the pattern formed on Substrate W of exposure and a development.

[0024] The inspection unit 10 and the inspection unit 20 are arranged by each in both corners of the interior upside of Indexer ID. More, when it sees from the upper part, the inspection unit 10

and the inspection unit 20 serve as relation included thoroughly into Indexer ID at accuracy (when it sees to the sense (-Z)).

[0025] Two or more arrangement of the processing unit which performs predetermined processing to Substrate W is carried out at the unit arrangement section MP. That is, two spreading processing units SC are arranged at the front-face side (-Y side) of the unit arrangement section MP. The spreading processing unit SC is the so-called spin coater which performs uniform resist spreading by dropping a photoresist at the substrate principal plane, rotating Substrate W.

[0026] Moreover, it is the tooth-back side (+Y side) of the unit arrangement section MP, and two development units SD are arranged in the same height location as the spreading processing unit SC. The development unit SD is the so-called spin developer who performs a development by supplying a developer on the substrate W after exposure. Opposite arrangement of the spreading processing unit SC and the development unit SD is carried out across the conveyance way 4.

[0027] In each upper part of two spreading processing units SC and two development units SD, the heat treatment unit group 5 is arranged on both sides of the fan filter unit which omits a graphic display (graphic display for convenience drawing 2 the heat treatment unit group 5 abbreviation). While cooling the so-called hot plate and so-called Substrate W which heat Substrate W and carry out temperature up even to predetermined temperature and lowering the temperature even to predetermined temperature, the so-called cool plate which maintains this substrate W to the predetermined temperature concerned is built into the heat treatment unit group 5. In addition, the BEKU unit after exposure which performs BEKU processing of the adhesion consolidation unit which performs adhesion consolidation processing to the substrate before resist spreading processing, and the substrate after exposure is contained in a hot plate. On these descriptions, a hot plate and a cool plate are named generically, it considers as a heat treatment unit, the spreading processing unit SC, the development unit SD, and a heat treatment unit are named generically, and it considers as a processing unit (processing section).

[0028] The carrier robot TR is stationed on the conveyance way 4 across which it faced between the spreading processing unit SC and the development unit SD. The carrier robot TR has two conveyance arms, and can make the same device as the transfer robot TF perform attitude migration that you make it go up and down the conveyance arm along the direction of a vertical, making it rotate in the level surface, and in the level surface. Thereby, a carrier robot TR can do circulation conveyance of the substrate W according to predetermined procedure between each processing unit arranged at the unit arrangement section MP. Moreover, a carrier robot TR can deliver Substrate W also between the transfer robot TF of Indexer ID, and Interface IFB.

[0029] Interface IFB has the function which receives the substrate W after exposure from this aligner, and is returned to the unit arrangement section MP while it receives the substrate [finishing / resist spreading processing] W from the unit arrangement section MP and passes it to the aligner outside drawing (stepper). In order to realize this function, the delivery robot (graphic display abbreviation) for delivering Substrate W to Interface IFB is stationed. Moreover, in order to cancel the difference of the processing time in the unit arrangement section MP, and the processing time in an aligner for Interface IFB, the buffer section which contains Substrate W temporarily is also prepared.

[0030] Drawing 4 is a functional block diagram for explaining the controlling mechanism of the above-mentioned substrate processor. The substrate processor equips the interior with the control section 50 for controlling the whole equipment. A control section 50 is equipped with the transfer section 57 which is the interface which notifies that recipe numbers are the magnetic disk 55 which is constituted by the computer and remembers the software for control, data, etc. to be CPU51 which is the body section and performs data processing, ROM52 which is read-only memory, and RAM53 which is the memory which can be written, and the host computer formed in the exterior of a substrate processor and the communications department 56 which performs a communication link to the inspection units 10 and 20. CPU51, and a magnetic disk 55 and transfer section 57 grade are electrically connected through the bus line 59. Moreover, the control panel 61 of a substrate processor, the display 62, the processing unit, the carrier robot

TR, the transfer robot TF, etc. are electrically connected to the bus line 59 of a control section 50. It is as having mentioned above about a processing section unit, carrier-robot TR, and the transfer robot TF.

[0031] The control panel 61 is constituted by the keyboard formed in the external wall surface of a substrate processor. A display 62 is the display put side by side to the control panel 61. An operator can input a command, a parameter, etc. from a control panel 61, checking the content displayed on the display 62. In addition, you may make it constitute in one by using a control panel 61 and a display 62 as a touch panel.

[0032] Moreover, an operator can do the setting-out input of the flow recipe which described the procedure of substrate processing from the control panel 61. The inputted flow recipe is memorized by the magnetic disk 55. CPU51 of a control section 50 controls a carrier robot TR and the transfer robot TF according to the flow recipe memorized by the magnetic disk 55, and makes Substrate W convey along with the procedure described by this flow recipe. Furthermore, an operator can also do the setting-out input of the recipe number later mentioned from a control panel 61.

[0033] Moreover, the inspection unit 20 contains the verifier 29 for conducting optical inspection to Substrate W, and the magnetic disk 25. Two or more inspection recipes which described the conditions about inspection besides the processing program for operating a verifier 29 are stored in the magnetic disk 25. In addition, although the graphic display is omitted in drawing 4, it considers as the configuration same also about the inspection unit 10 as the inspection unit 20.

[0034] Drawing 5 is drawing showing two or more inspection recipes which the inspection unit 20 holds. The "inspection point", "inspection time amount", etc. which are a location on the conditions W about inspection, for example, the substrate which should conduct inspection, are described by each inspection recipe. Moreover, when two or more kinds of inspection can be conducted like the inspection unit 20, it is described by the inspection recipe which inspection is conducted. A different recipe number is attached to each of two or more inspection recipes. The inspection unit 20 performs inspection to Substrate W according to the verification condition described by either of two or more inspection recipes.

[0035] Next, the processing in the substrate processor which has the above-mentioned configuration is explained. Substrate processing advances, when CPU51 of a control section 50 controls a carrier robot TR and the transfer robot TF according to the flow recipe memorized by the magnetic disk 55. An example of a flow recipe is shown in the following table 1.

[0036]

[A table 1]

ステップ	搬送先	レシピ番号
1	ホットプレート	
2	クールプレート	
3	塗布処理ユニット	
4	ホットプレート	
5	クールプレート	
6	露光装置	
7	ホットプレート	
8	クールプレート	
9	現像処理ユニット	
10	ホットプレート	
11	クールプレート	
12	検査ユニット	No. 2
13	インテクサ	

[0037] The setting-out input of such a flow recipe is done by the operator from a control panel 61 at a control section 50. Moreover, you may make it transmit the flow recipe like a table 1 to a control section 50 through the communications department 56 from the host computer besides a substrate processor. Even if it is any, the flow recipe by which the setting-out input was carried out is memorized by the magnetic disk 55 of a control section 50. When the inspection unit 10 or the inspection unit 20 is contained in the conveyance place of Substrate W on the occasion of the setting-out input of a flow recipe, an operator chooses and specifies the recipe number used in the inspection unit from a control panel 61. The selected recipe number is matched with the conveyance place "an inspection unit" of step 12, and is described by the flow recipe. "No.2" is described as a recipe number by the table 1. And CPU41 controls a carrier robot TR and the transfer robot TF to carry out sequential conveyance of the substrate according to the flow recipe of a table 1.

[0038] First, the transfer robot TF of Indexer ID picks out the unsettled substrate W from Carrier C, and hands the carrier robot TR of the unit arrangement section MP. When taking out the unsettled substrate W, the transfer robot TF moves to the transverse plane of the carrier C which contained this substrate W, and the transfer arm 75 is inserted under the substrate W. And the transfer robot TF raises the transfer arm 75 a little, Substrate W is held, and the unsettled substrate W is taken out by making the transfer arm 75 leave.

[0039] According to the flow recipe of a table 1, circulation conveyance of the substrate W passed to the unit arrangement section MP is carried out between each processing unit by the carrier robot TR, and sequential processing is performed. That is, after conveying the substrate W which performed adhesion consolidation processing (step 1) with the hot plate on a cool plate and performing cooling processing (step 2), it conveys to the spreading processing unit SC, and resist spreading processing (step 3) is performed. Then, after conveying the substrate W with which the resist was applied to a hot plate and performing prebaking processing (step 4), it conveys on a cool plate, cooling processing (step 5) is performed, and the resist film is formed. The substrate W with which the resist film was formed is passed to an aligner through Interface IFB, and exposure processing (step 6) of a pattern is performed.

[0040] The substrate W which exposure processing ended is again returned to the unit arrangement section MP through Interface IFB from an aligner. After conveying to a hot plate to the substrate W after exposure, performing BEKU processing after exposure (step 7) and a cool plate's performing cooling processing (step 8), it conveys to the development unit SD and a development (step 9) is performed. The substrate W which the development ended is passed to the transfer robot TF of Indexer ID from the carrier robot TR of the unit arrangement section MP, after cooling processing (step 11) is further performed by the hot plate on BEKU processing (step 10) and a cool plate. The transfer robot TF which received Substrate W conveys the substrate W to the inspection unit 20 (step 12). With this operation gestalt, line breadth measurement of a pattern is performed to Substrate W as inspection. With the transfer robot TF, the substrate W after inspection termination is picked out from the inspection unit 20, and is contained by Carrier C (step 13).

[0041] Here, the content of the inspection to Substrate W is not limited to line breadth measurement of a pattern, and the phase of inspecting is not limited after the last cooling processing (step 11) termination, either. For example, as for the thickness measurement of a resist, it is desirable among various inspection to carry out to the substrate W before carrying in to the aligner after prebaking. In this case, the substrate W which prebaking processing ended is once returned to Indexer ID from the unit arrangement section MP, and the transfer robot TF carries in this substrate W to the inspection unit 20. The substrate W which the thickness measurement of a resist ended will be again handed to the unit arrangement section MP by the transfer robot TF from the inspection unit 20, will be handed to Interface IFB from the carrier robot TR of the unit arrangement section MP, and will be carried in to an aligner.

[0042] Moreover, about macroscopic defect inspection and superposition measurement of a pattern, it is desirable to carry out to the substrate W which all processings were completed as well as line breadth measurement of the above-mentioned pattern, and has returned to Indexer ID. About macroscopic defect inspection, the transfer robot TF carries in to the inspection unit

10 the substrate W which all processings were completed and has returned to Indexer ID, and is made to perform it. The transfer robot TF carries in to the inspection unit 20 the substrate W which all processings were completed and has returned to Indexer ID about superposition measurement of a pattern on the other hand, and is made to perform it. The substrate W with which inspection was completed in any case is contained by Carrier C with the transfer robot TF from the inspection unit 10 or the inspection unit 20.

[0043] It can be freely set [above] up with a flow recipe in which phase Substrate W is conveyed to which inspection unit. When it also describes that to a flow recipe that it is made to conduct [to follow, for example, to also inspect before all processings and] two or more kinds of inspection, it can set up freely. And when CPU41 controls a carrier robot TR, inspection of various patterns is realized so that sequential conveyance of the substrate may be carried out according to the set-up flow recipe. Therefore, the degree of freedom of substrate inspection becomes high, and a substrate can be inspected efficiently.

[0044] By the way, it becomes settled by whether inspection is performed according to which inspection recipe on what kind of conditions it inspects to the substrate W carried in to the inspection unit 20. In the example mentioned above, an operator chooses a recipe number "No.2" from a control panel 61, and the recipe number is described by the flow recipe (table 1). The transfer section 57 of the control section 50 which is controlling according to the flow recipe transmits that the recipe number chosen about the substrate concerned is "No.2", before the transfer robot TF carries in a substrate to the inspection unit 20. And the inspection unit 20 performs inspection to the substrate concerned on the conditions described by the inspection recipe of recipe number No.2.

[0045] That is, with this operation gestalt, while describing different conditions about inspection to each of two or more inspection recipes, the number (recipe number) of a proper which is different in each of the inspection recipe of these plurality is matched. In addition, the inspection recipe itself is made to hold to the inspection unit 20. And about whether which inspection recipe is used, an operator can choose from a control panel 61 the recipe number matched with either of two or more inspection recipes, and the conditions about inspection with the inspection unit 20 can be specified by it. The selected recipe number is described by the flow recipe and transmitted to the inspection unit 20 from the transfer section 57 of the control section 50 which performs control according to a flow recipe. In the inspection unit 20, a substrate is inspected according to the inspection recipe matched with the selected recipe number. That is, string attachment by the inspection recipe and the flow recipe is performed by describing a recipe number to a flow recipe.

[0046] If it does in this way, by also combining selection of a recipe number and performing it at the time of the input of a flow recipe, an operator can choose an inspection recipe from a substrate processor side, and can set up the conditions about inspection of a substrate easily. Therefore, a failure etc. can also be prevented while being able to improve the patient throughput of Substrate W. In addition, an inspection recipe is similarly chosen about the inspection unit 10.

[0047] As mentioned above, although the gestalt of operation of this invention was explained, this invention is not limited to the above-mentioned example. For example, although it is made to perform the so-called string attachment by describing the recipe number chosen from the control panel 61 to a flow recipe, it is not limited to this and you may make it transmit directly the recipe number chosen from the control panel 61 to an inspection unit from the transfer section 57 in the above-mentioned operation gestalt according to the timing by which Substrate W is carried in to an inspection unit.

[0048] Moreover, it replaces with a recipe number and you may make it use the code which has discernment functions, such as the alphabet and a notation. In this case, by choosing a code from a control panel 61, the inspection recipe used in an inspection unit is determined, and the conditions about inspection are specified.

[0049] That is, various technique is employable if it is the gestalt which can specify the inspection recipe used in an inspection unit from a substrate processor side.

[0050] Moreover, in the above-mentioned operation gestalt, although he was trying to arrange two inspection units (the inspection unit 10 and inspection unit 20) inside Indexer ID, it may not

be limited to this, and the number of inspection units may be one and they may be two or more. Moreover, it is not limited to the interior of Indexer ID, and the arrangement locations of an inspection unit may also be the unit arrangement section MP and the interior of Interface IFB, and you may make it attach them to the exterior of a substrate processor. And what is necessary is just to let each inspection unit be the inspection unit which conducts at least one or more kinds of inspection of the thickness measurement which measures the thickness of a resist, the line breadth measurement which measures the line breadth of a pattern, the superposition measurement which measures the superposition of a pattern, and the macroscopic defect inspection.

[0051] Moreover, in the above-mentioned operation gestalt, although considered as the so-called single arm which equips the transfer robot TF of Indexer ID with one transfer arm, it is good also as the so-called gestalt of a double arm equipped with two transfer arms. If Indexer ID is equipped with an inspection unit, since the transfer robot's TF access frequency will naturally increase more than before, the conveyance effectiveness of direction used as the transfer robot TF having two transfer arms of Substrate W improves, and the throughput of a substrate processor improves.

[0052] Moreover, in the above-mentioned operation gestalt, although the substrate processor was used as the equipment which performs resist spreading processing and a development to a substrate and the function of an inspection unit was made into the gestalt which conducts inspection relevant to the so-called photolithography, the technique concerning this invention is not limited to this. For example, you may make it adopt the thing equipped with the checking feature which measures an amine or ammonia concentration as an inspection unit. Moreover, you may make it arrange the inspection unit which performs particle inspection to the substrate processors (the so-called spin scrubber etc.) from which the particle adhering to a substrate etc. is removed. Moreover, you may make it arrange the inspection unit which inspects the baking condition of the interlayer insulation film to the equipment which applies SOD (Spin-on-Dielectronics) to a substrate, and forms an interlayer insulation film. Furthermore, the substrate processed with other substrate processors is carried in, and after conducting the inspection, you may make it arrange an inspection unit to a substrate processor which acts to processing conditions as the feedforward of the inspection result. Even if it is which case, by choosing a recipe number from a control panel 61, by specifying the inspection recipe used in an inspection unit, an inspection recipe can be chosen from a substrate processor side, and the conditions about inspection of a substrate can be set up easily.

[0053]

[Effect of the Invention] As mentioned above, since the conditions about the inspection about the substrate concerned specified from the assignment means are transmitted to the Banking Inspection Department according to invention of claim 1 before a taking-out acquisition stage carries in a substrate to the Banking Inspection Department as explained, the conditions about inspection can be specified from a substrate processor side, and the conditions about inspection of a substrate can be set up easily.

[0054] Moreover, according to invention of claim 2, the Banking Inspection Department holds two or more inspection recipes which described the conditions about inspection, and since an assignment means specifies the conditions about inspection by choosing either of two or more inspection recipes, it can set up the conditions about inspection of a substrate easily through an inspection recipe.

[0055] Moreover, according to invention of claim 3, a different code is matched with two or more inspection recipes, and since an assignment means specifies the conditions about inspection by choosing the code matched with either of two or more inspection recipes, it can specify an inspection recipe easily.

[0056] Moreover, since the code chosen by the assignment means is described by the flow recipe which described the procedure of a substrate according to invention of claim 4, the conditions about inspection can be certainly specified from a substrate processor side, and the conditions about inspection of a substrate can be set up easily.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the substrate processor incorporating the Banking Inspection Department which conducts predetermined inspection, for example, the thickness measurement of a resist etc., to a semi-conductor substrate, the glass substrate for liquid crystal displays, the glass substrate for photo masks, the substrate for optical disks (a "substrate" is only called hereafter), etc.

[Translation done.]

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PRIOR ART

[Description of the Prior Art] As everyone knows, products, such as a semi-conductor and a liquid crystal display, are manufactured by performing a series of processings of washing, resist spreading, exposure, development, etching, formation of an interlayer insulation film, heat treatment, dicing, etc. of many to the above-mentioned substrate. It is important to conduct various inspection of a substrate and to perform quality assurance after the process whose varicus above-mentioned processings settled, because of quality maintenance, such as this semi-conductor product.

[0003] For example, in the substrate processor (the so-called coater & developer) which performs resist spreading processing and a development, it is made to inspect line breadth measurement of the pattern on a substrate etc. in the final process of a development conventionally. The substrate which serves as a subject of examination at this time is once taken out from a substrate processor, and inspection will be presented after being carried in to the test equipment of the dedication prepared in another location. And the inspection result is fed back to a substrate processor, and adjustment of various processing conditions is performed.

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EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, since the conditions about the inspection about the substrate concerned specified from the assignment means are transmitted to the Banking Inspection Department according to invention of claim 1 before a taking-out acquisition stage carries in a substrate to the Banking Inspection Department as explained, the conditions about inspection can be specified from a substrate processor side, and the conditions about inspection of a substrate can be set up easily.

[0054] Moreover, according to invention of claim 2, the Banking Inspection Department holds two or more inspection recipes which described the conditions about inspection, and since an assignment means specifies the conditions about inspection by choosing either of two or more inspection recipes, it can set up the conditions about inspection of a substrate easily through an inspection recipe.

[0055] Moreover, according to invention of claim 3, a different code is matched with two or more inspection recipes, and since an assignment means specifies the conditions about inspection by choosing the code matched with either of two or more inspection recipes, it can specify an inspection recipe easily.

[0056] Moreover, since the code chosen by the assignment means is described by the flow recipe which described the procedure of a substrate according to invention of claim 4, the conditions about inspection can be certainly specified from a substrate processor side, and the conditions about inspection of a substrate can be set up easily.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in the former, two or more recipes which described the verification condition are given to the test equipment incorporated in the substrate processor, and the recipe switch from a test equipment side is made to perform what kind of inspection is conducted according to what kind of conditions uniquely. That is, apart from setting out of the substrate processing conditions from a substrate processor etc. as an operator, the verification condition of test equipment needed to be set up separately.

[0007] For this reason, while the patient throughput of a substrate fell, there was a problem of being easy to produce a failure etc.

[0008] This invention is made in view of the above-mentioned technical problem, and aims at offering the substrate processor which can set up the conditions about inspection of a substrate easily.

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MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, invention of claim 1 With the Banking Inspection Department which is the substrate processor which equipped the substrate with the processing section which performs predetermined processing, and conducts predetermined inspection to a substrate The taking-out acquisition stage which carries out taking-out close [of the substrate] to said Banking Inspection Department, and an assignment means to specify the conditions about inspection in said Banking Inspection Department, Before said taking-out acquisition stage carries in a substrate to said Banking Inspection Department; it has the means of communication which transmits the conditions about the inspection about the substrate concerned specified from said assignment means to said Banking Inspection Department.

[0010] Moreover, invention of claim 2 makes two or more inspection recipes which described the conditions about inspection hold to said Banking Inspection Department, and is making it specify the conditions about inspection in the substrate processor concerning invention of claim 1 by choosing either of said two or more inspection recipes as said assignment means.

[0011] Moreover, invention of claim 3 is making the conditions about inspection specify it as said two or more inspection recipes in the substrate processor concerning invention of claim 2 by choosing the code which a different code was matched and was matched with said assignment means by either of said two or more inspection recipes.

[0012] Moreover, invention of claim 4 has described the code chosen by said assignment means in the substrate processor concerning invention of claim 3 to the flow recipe which described the procedure of a substrate.

[0013]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail, referring to a drawing.

[0014] Drawing 1 is the perspective view showing the outline of the whole substrate processor concerning this invention. Moreover, drawing 2 is the top view showing the outline configuration of this substrate processor. In addition, the XYZ rectangular coordinate system which makes Z shaft orientations the direction of a vertical in order to clarify those direction relation at drawing 1, drawing 2, and drawing 3, and makes XY flat surface the level surface is attached. This substrate processor is a substrate processor (the so-called coater & developer) which performs resist spreading processing and a development to Substrate W, is divided roughly and constituted by Indexer ID, and the unit arrangement section MP and Interface IFB.

[0015] While Indexer ID is equipped with the transfer robot TF, the inspection units 10 and 20 (Banking Inspection Department), and the installation stage 30, the display 62 is installed in the external wall surface of Indexer ID. Four carriers C can be arranged and laid in the installation stage 30 along a horizontal direction (Y shaft orientations). The receipt slot on multistage is engraved on each carrier C, and one substrate W can be held in a horizontal position in each slot (making a principal plane meet the level surface). Therefore, on each carrier C, where it separated predetermined spacing to a horizontal position and multistage and the laminating of two or more substrates W (for example, 25 sheets) is carried out to them, it can contain. In addition, as a gestalt of Carrier C, you may be any of FOUP (front opening unified pod) which

contains Substrate W to a closed space, or OC (open cassette) which puts the receipt substrate W to the open air.

[0016] Drawing 3 is the transfer robot's TF appearance perspective view. The transfer robot TF has realized the multistage embedded structure of a telescopic mold with the flexible object 40 while establishing the arm stage 35 equipped with one transfer arm 75 in the upper part of the flexible object 40.

[0017] The flexible object 40 is constituted by four division objects 40a, 40b, 40c, and 40d sequentially from the top. Division object 40a can be held in division object 40b, division object 40b can be held in division object 40c, and division object 40c can be held in 40d of division objects. And by containing the division objects 40a-40d one by one, it contracts and the flexible object 40 elongates the flexible object 40 by pulling out the division objects 40a-40d one by one conversely. That is, division object 40a is held in division object 40b at the time of contraction of the flexible object 40, division object 40b is held in division object 40c, and division object 40c is held in 40d of division objects. On the other hand, division object 40a is pulled out from division object 40b at the time of extension of the flexible object 40, division object 40b is pulled out from division object 40c, and division object 40c is pulled out from 40d of division objects.

[0018] Flexible actuation of the flexible object 40 is realized by the flexible elevator style prepared in the interior. The device in which what combined two or more belts and rollers is driven by the motor as a flexible elevator style, for example is employable. The transfer robot TF can perform rise-and-fall actuation which met in the direction of a vertical of the transfer arm 75 (Z shaft orientations) by such flexible elevator style.

[0019] Moreover, as shown in drawing 3, the transfer robot's TF conveyance arm 75 can be moved in accordance with Y shaft orientations with a male screw 77 and Y drive which is a drive of Y shaft orientations which consist of guide-rail 76 grade. That is, in accordance with Y shaft orientations, slide migration of the 40d of the division objects screwed in a male screw 77 can be carried out by rotating a male screw 77 with the electric motor outside drawing.

[0020] Furthermore, the transfer robot TF can also perform level attitude migration and revolution actuation of the transfer arm 75. The arm stage 35 is established in the upper part of division object 40a, and, specifically, the arm stage 35 performs level attitude migration and revolution actuation of the transfer arm 75. That is, when the arm stage 35 makes the arm segment of the transfer arm 75 bend and stretch, the transfer arm 75 performs level attitude migration and arm stage 35 the very thing performs revolution actuation to the flexible object 40, the transfer arm 75 performs revolution actuation.

[0021] Therefore, the transfer robot TF can make making horizontal migration carry out in the height direction in accordance with carrying out rise-and-fall actuation and Y shaft orientations, carrying out revolution actuation, and a horizontal direction carry out attitude migration of the transfer arm 75. That is, the transfer robot TF can move the transfer arm 75 in three dimension.

[0022] By actuation of such a transfer robot TF, Indexer ID can receive the substrate [finishing / processing] W from the unit arrangement section MP, and can contain it on Carrier C while it picks out the unsettled substrate W from the carrier C which can contain two or more substrates W and passes it to the unit arrangement section MP. Moreover, Indexer ID performs the taking-out close of the substrate W to the inspection unit 10 and the inspection unit 20 with the transfer robot TF.

[0023] The inspection unit 10 is an inspection unit (macroscopic defect inspection unit) which conducts macroscopic defect inspection. "Macroscopic defect inspection" is the comparatively big defect appeared on Substrate W, for example, inspection which judges the existence of adhesion of particle. On the other hand, the inspection unit 20 is an inspection unit which performs thickness measurement of a resist, line breadth measurement of a pattern, and superposition measurement of a pattern. That is, the inspection unit 20 can conduct three kinds of inspection in one inspection unit. "Thickness measurement of a resist" is inspection which measures the thickness of the resist applied on Substrate W. "Line breadth measurement of a pattern" is inspection which measures the line breadth of the pattern formed on Substrate W of exposure and a development. "Superposition measurement of a pattern" is inspection which measures a gap of the pattern formed on Substrate W of exposure and a development.

[0024] The inspection unit 10 and the inspection unit 20 are arranged by each in both corners of the interior upside of Indexer ID. More, when it sees from the upper part, the inspection unit 10 and the inspection unit 20 serve as relation included thoroughly into Indexer ID at accuracy (when it sees to the sense (-Z)).

[0025] Two or more arrangement of the processing unit which performs predetermined processing to Substrate W is carried out at the unit arrangement section MP. That is, two spreading processing units SC are arranged at the front-face side (-Y side) of the unit arrangement section MP. The spreading processing unit SC is the so-called spin coater which performs uniform resist spreading by dropping a photoresist at the substrate principal plane, rotating Substrate W.

[0026] Moreover, it is the tooth-back side (+Y side) of the unit arrangement section MP, and two development units SD are arranged in the same height location as the spreading processing unit SC. The development unit SD is the so-called spin developer who performs a development by supplying a developer on the substrate W after exposure. Opposite arrangement of the spreading processing unit SC and the development unit SD is carried out across the conveyance way 4.

[0027] In each upper part of two spreading processing units SC and two development units SD, the heat treatment unit group 5 is arranged on both sides of the fan filter unit which omits a graphic display (graphic display for convenience drawing 2 the heat treatment unit group 5 abbreviation). While cooling the so-called hot plate and so-called Substrate W which heat Substrate W and carry out temperature up even to predetermined temperature and lowering the temperature even to predetermined temperature, the so-called cool plate which maintains this substrate W to the predetermined temperature concerned is built into the heat treatment unit group 5. In addition, the BEKU unit after exposure which performs BEKU processing of the adhesion consolidation unit which performs adhesion consolidation processing to the substrate before resist spreading processing, and the substrate after exposure is contained in a hot plate. On these descriptions, a hot plate and a cool plate are named generically, it considers as a heat treatment unit, the spreading processing unit SC, the development unit SD, and a heat treatment unit are named generically, and it considers as a processing unit (processing section).

[0028] The carrier robot TR is stationed on the conveyance way 4 across which it faced between the spreading processing unit SC and the development unit SD. The carrier robot TR has two conveyance arms, and can make the same device as the transfer robot TF perform attitude migration that you make it go up and down the conveyance arm along the direction of a vertical, making it rotate in the level surface, and in the level surface. Thereby, a carrier robot TR can do circulation conveyance of the substrate W according to predetermined procedure between each processing unit arranged at the unit arrangement section MP. Moreover, a carrier robot TR can deliver Substrate W also between the transfer robot TF of Indexer ID, and Interface IFB.

[0029] Interface IFB has the function which receives the substrate W after exposure from this aligner, and is returned to the unit arrangement section MP while it receives the substrate [finishing / resist spreading processing] W from the unit arrangement section MP and passes it to the aligner outside drawing (stepper). In order to realize this function, the delivery robot (graphic display abbreviation) for delivering Substrate W to Interface IFB is stationed. Moreover, in order to cancel the difference of the processing time in the unit arrangement section MP, and the processing time in an aligner for Interface IFB, the buffer section which contains Substrate W temporarily is also prepared.

[0030] Drawing 4 is a functional block diagram for explaining the controlling mechanism of the above-mentioned substrate processor. The substrate processor equips the interior with the control section 50 for controlling the whole equipment. A control section 50 is equipped with the transfer section 57 which is the interface which notifies that recipe numbers are the magnetic disk 55 which is constituted by the computer and remembers the software for control, data, etc. to be CPU51 which is the body section and performs data processing, ROM52 which is read-only memory, and RAM53 which is the memory which can be written, and the host computer formed in the exterior of a substrate processor and the communications department 56 which performs a communication link to the inspection units 10 and 20. CPU51, and a magnetic disk 55 and

transfer section 57 grade are electrically connected through the bus line 59. Moreover, the control panel 61 of a substrate processor, the display 62, the processing unit, the carrier robot TR, the transfer robot TF, etc. are electrically connected to the bus line 59 of a control section 50. It is as having mentioned above about a processing section unit, carrier-robot TR, and the transfer robot TF.

[0031] The control panel 61 is constituted by the keyboard formed in the external wall surface of a substrate processor. A display 62 is the display put side by side to the control panel 61. An operator can input a command, a parameter, etc. from a control panel 61, checking the content displayed on the display 62. In addition, you may make it constitute in one by using a control panel 61 and a display 62 as a touch panel.

[0032] Moreover, an operator can do the setting-out input of the flow recipe which described the procedure of substrate processing from the control panel 61. The inputted flow recipe is memorized by the magnetic disk 55. CPU51 of a control section 50 controls a carrier robot TR and the transfer robot TF according to the flow recipe memorized by the magnetic disk 55, and makes Substrate W convey along with the procedure described by this flow recipe. Furthermore, an operator can also do the setting-out input of the recipe number later mentioned from a control panel 61.

[0033] Moreover, the inspection unit 20 contains the verifier 29 for conducting optical inspection to Substrate W, and the magnetic disk 25. Two or more inspection recipes which described the conditions about inspection besides the processing program for operating a verifier 29 are stored in the magnetic disk 25. In addition, although the graphic display is omitted in drawing 4, it considers as the configuration same also about the inspection unit 10 as the inspection unit 20.

[0034] Drawing 5 is drawing showing two or more inspection recipes which the inspection unit 20 holds. The "inspection point", "inspection time amount", etc. which are a location on the conditions W about inspection, for example, the substrate which should conduct inspection, are described by each inspection recipe. Moreover, when two or more kinds of inspection can be conducted like the inspection unit 20, it is described by the inspection recipe which inspection is conducted. A different recipe number is attached to each of two or more inspection recipes. The inspection unit 20 performs inspection to Substrate W according to the verification condition described by either of two or more inspection recipes.

[0035] Next, the processing in the substrate processor which has the above-mentioned configuration is explained. Substrate processing advances, when CPU51 of a control section 50 controls a carrier robot TR and the transfer robot TF according to the flow recipe memorized by the magnetic disk 55. An example of a flow recipe is shown in the following table 1.

[0036]

[A table 1]

ステップ	搬送先	レシピ番号
1	ホットプレート	
2	クールプレート	
3	塗布処理ユニット	
4	ホットプレート	
5	クールプレート	
6	露光装置	
7	ホットプレート	
8	クールプレート	
9	現像処理ユニット	
10	ホットプレート	
11	クールプレート	
12	検査ユニット	No. 2
13	インデクサ	

[0037] The setting-out input of such a flow recipe is done by the operator from a control panel 61 at a control section 50. Moreover, you may make it transmit the flow recipe like a table 1 to a control section 50 through the communications department 56 from the host computer besides a substrate processor. Even if it is any, the flow recipe by which the setting-out input was carried out is memorized by the magnetic disk 55 of a control section 50. When the inspection unit 10 or the inspection unit 20 is contained in the conveyance place of Substrate W on the occasion of the setting-out input of a flow recipe, an operator chooses and specifies the recipe number used in the inspection unit from a control panel 61. The selected recipe number is matched with the conveyance place "an inspection unit" of step 12, and is described by the flow recipe. "No.2" is described as a recipe number by the table 1. And CPU41 controls a carrier robot TR and the transfer robot TF to carry out sequential conveyance of the substrate according to the flow recipe of a table 1.

[0038] First, the transfer robot TF of Indexer ID picks out the unsettled substrate W from Carrier C, and hands the carrier robot TR of the unit arrangement section MP. When taking out the unsettled substrate W, the transfer robot TF moves to the transverse plane of the carrier C which contained this substrate W, and the transfer arm 75 is inserted under the substrate W. And the transfer robot TF raises the transfer arm 75 a little, Substrate W is held, and the unsettled substrate W is taken out by making the transfer arm 75 leave.

[0039] According to the flow recipe of a table 1, circulation conveyance of the substrate W passed to the unit arrangement section MP is carried out between each processing unit by the carrier robot TR, and sequential processing is performed. That is, after conveying the substrate W which performed adhesion consolidation processing (step 1) with the hot plate on a cool plate and performing cooling processing (step 2), it conveys to the spreading processing unit SC, and resist spreading processing (step 3) is performed. Then, after conveying the substrate W with which the resist was applied to a hot plate and performing prebaking processing (step 4), it conveys on a cool plate, cooling processing (step 5) is performed, and the resist film is formed. The substrate W with which the resist film was formed is passed to an aligner through Interface IFB, and exposure processing (step 6) of a pattern is performed.

[0040] The substrate W which exposure processing ended is again returned to the unit arrangement section MP through Interface IFB from an aligner. After conveying to a hot plate to the substrate W after exposure, performing BEKU processing after exposure (step 7) and a cool plate's performing cooling processing (step 8), it conveys to the development unit SD and a development (step 9) is performed. The substrate W which the development ended is passed to the transfer robot TF of Indexer ID from the carrier robot TR of the unit arrangement section

MP, after cooling processing (step 11) is further performed by the hot plate on BEKU processing (step 10) and a cool plate. The transfer robot TF which received Substrate W conveys the substrate W to the inspection unit 20 (step 12). With this operation gestalt, line breadth measurement of a pattern is performed to Substrate W as inspection. With the transfer robot TF, the substrate W after inspection termination is picked out from the inspection unit 20, and is contained by Carrier C (step 13).

[0041] Here, the content of the inspection to Substrate W is not limited to line breadth measurement of a pattern, and the phase of inspecting is not limited after the last cooling processing (step 11) termination, either. For example, as for the thickness measurement of a resist, it is desirable among various inspection to carry out to the substrate W before carrying in to the aligner after prebaking. In this case, the substrate W which prebaking processing ended is once returned to Indexer ID from the unit arrangement section MP, and the transfer robot TF carries in this substrate W to the inspection unit 20. The substrate W which the thickness measurement of a resist ended will be again handed to the unit arrangement section MP by the transfer robot TF from the inspection unit 20, will be handed to Interface IFB from the carrier robot TR of the unit arrangement section MP, and will be carried in to an aligner.

[0042] Moreover, about macroscopic defect inspection and superposition measurement of a pattern, it is desirable to carry out to the substrate W which all processings were completed as well as line breadth measurement of the above-mentioned pattern, and has returned to Indexer ID. About macroscopic defect inspection, the transfer robot TF carries in to the inspection unit 10 the substrate W which all processings were completed and has returned to Indexer ID, and is made to perform it. The transfer robot TF carries in to the inspection unit 20 the substrate W which all processings were completed and has returned to Indexer ID about superposition measurement of a pattern on the other hand, and is made to perform it. The substrate W with which inspection was completed in any case is contained by Carrier C with the transfer robot TF from the inspection unit 10 or the inspection unit 20.

[0043] It can be freely set [above] up with a flow recipe in which phase Substrate W is conveyed to which inspection unit. When it also describes that to a flow recipe that it is made to conduct [to follow, for example, to also inspect before all processings and] two or more kinds of inspection, it can set up freely. And when CPU41 controls a carrier robot TR, inspection of various patterns is realized so that sequential conveyance of the substrate may be carried out according to the set-up flow recipe. Therefore, the degree of freedom of substrate inspection becomes high, and a substrate can be inspected efficiently.

[0044] By the way, it becomes settled by whether inspection is performed according to which inspection recipe on what kind of conditions it inspects to the substrate W carried in to the inspection unit 20. In the example mentioned above, an operator chooses a recipe number "No.2" from a control panel 61, and the recipe number is described by the flow recipe (table 1). The transfer section 57 of the control section 50 which is controlling according to the flow recipe transmits that the recipe number chosen about the substrate concerned is "No.2", before the transfer robot TF carries in a substrate to the inspection unit 20. And the inspection unit 20 performs inspection to the substrate concerned on the conditions described by the inspection recipe of recipe number No.2.

[0045] That is, with this operation gestalt, while describing different conditions about inspection to each of two or more inspection recipes, the number (recipe number) of a proper which is different in each of the inspection recipe of these plurality is matched. In addition, the inspection recipe itself is made to hold to the inspection unit 20. And about whether which inspection recipe is used, an operator can choose from a control panel 61 the recipe number matched with either of two or more inspection recipes, and the conditions about inspection with the inspection unit 20 can be specified by it. The selected recipe number is described by the flow recipe and transmitted to the inspection unit 20 from the transfer section 57 of the control section 50 which performs control according to a flow recipe. In the inspection unit 20, a substrate is inspected according to the inspection recipe matched with the selected recipe number. That is, string attachment by the inspection recipe and the flow recipe is performed by describing a recipe number to a flow recipe.

[0046] If it does in this way, by also combining selection of a recipe number and performing it at the time of the input of a flow recipe, an operator can choose an inspection recipe from a substrate processor side, and can set up the conditions about inspection of a substrate easily.

Therefore, a failure etc. can also be prevented while being able to improve the patient throughput of Substrate W. In addition, an inspection recipe is similarly chosen about the inspection unit 10.

[0047] As mentioned above, although the gestalt of operation of this invention was explained, this invention is not limited to the above-mentioned example. For example, although it is made to perform the so-called string attachment by describing the recipe number chosen from the control panel 61 to a flow recipe, it is not limited to this and you may make it transmit directly the recipe number chosen from the control panel 61 to an inspection unit from the transfer section 57 in the above-mentioned operation gestalt according to the timing by which Substrate W is carried in to an inspection unit.

[0048] Moreover, it replaces with a recipe number and you may make it use the code which has discernment functions, such as the alphabet and a notation. In this case, by choosing a code from a control panel 61, the inspection recipe used in an inspection unit is determined, and the conditions about inspection are specified.

[0049] That is, various technique is employable if it is the gestalt which can specify the inspection recipe used in an inspection unit from a substrate processor side.

[0050] Moreover, in the above-mentioned operation gestalt, although he was trying to arrange two inspection units (the inspection unit 10 and inspection unit 20) inside Indexer ID, it may not be limited to this, and the number of inspection units may be one and they may be two or more. Moreover, it is not limited to the interior of Indexer ID, and the arrangement locations of an inspection unit may also be the unit arrangement section MP and the interior of Interface IFB, and you may make it attach them to the exterior of a substrate processor. And what is necessary is just to let each inspection unit be the inspection unit which conducts at least one or more kinds of inspection of the thickness measurement which measures the thickness of a resist, the line breadth measurement which measures the line breadth of a pattern, the superposition measurement which measures the superposition of a pattern, and the macroscopic defect inspection.

[0051] Moreover, in the above-mentioned operation gestalt, although considered as the so-called single arm which equips the transfer robot TF of Indexer ID with one transfer arm, it is good also as the so-called gestalt of a double arm equipped with two transfer arms. If Indexer ID is equipped with an inspection unit, since the transfer robot's TF access frequency will naturally increase more than before, the conveyance effectiveness of direction used as the transfer robot TF having two transfer arms of Substrate W improves, and the throughput of a substrate processor improves.

[0052] Moreover, in the above-mentioned operation gestalt, although the substrate processor was used as the equipment which performs resist spreading processing and a development to a substrate and the function of an inspection unit was made into the gestalt which conducts inspection relevant to the so-called photolithography, the technique concerning this invention is not limited to this. For example, you may make it adopt the thing equipped with the checking feature which measures an amine or ammonia concentration as an inspection unit. Moreover, you may make it arrange the inspection unit which performs particle inspection to the substrate processors (the so-called spin scrubber etc.) from which the particle adhering to a substrate etc. is removed. Moreover, you may make it arrange the inspection unit which inspects the baking condition of the interlayer insulation film to the equipment which applies SOD (Spin-on-Dielectrics) to a substrate, and forms an interlayer insulation film. Furthermore, the substrate processed with other substrate processors is carried in, and after conducting the inspection, you may make it arrange an inspection unit to a substrate processor which acts to processing conditions as the feedforward of the inspection result. Even if it is which case, by choosing a recipe number from a control panel 61, by specifying the inspection recipe used in an inspection unit, an inspection recipe can be chosen from a substrate processor side, and the conditions about inspection of a substrate can be set up easily.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing the outline of the whole substrate processor concerning this invention.

[Drawing 2] It is the top view showing the outline configuration of the substrate processor of drawing 1.

[Drawing 3] It is a transfer robot's appearance perspective view.

[Drawing 4] It is a functional block diagram for explaining the controlling mechanism of a substrate processor.

[Drawing 5] It is drawing showing two or more inspection recipes which an inspection unit holds.

[Description of Notations]

1 Substrate Processor

10 20 Inspection unit

50 Control Section

57 Transfer Section

61 Control Panel

TF Transfer robot

SC Spreading processing unit

SD Development unit

W Substrate

[Translation done.]

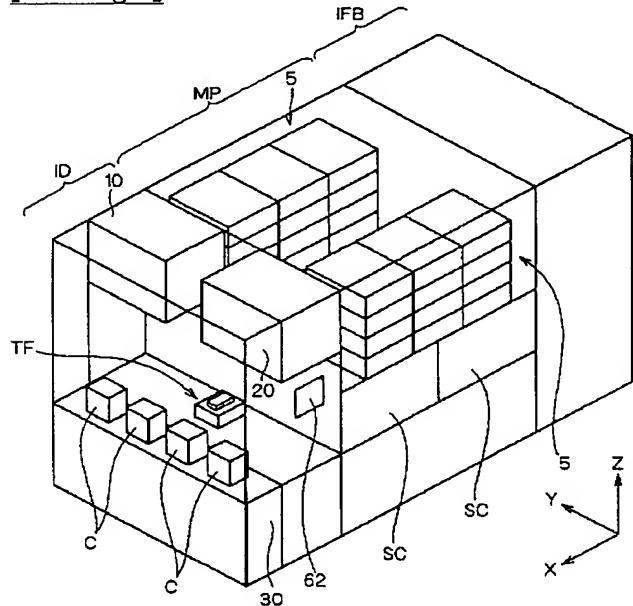
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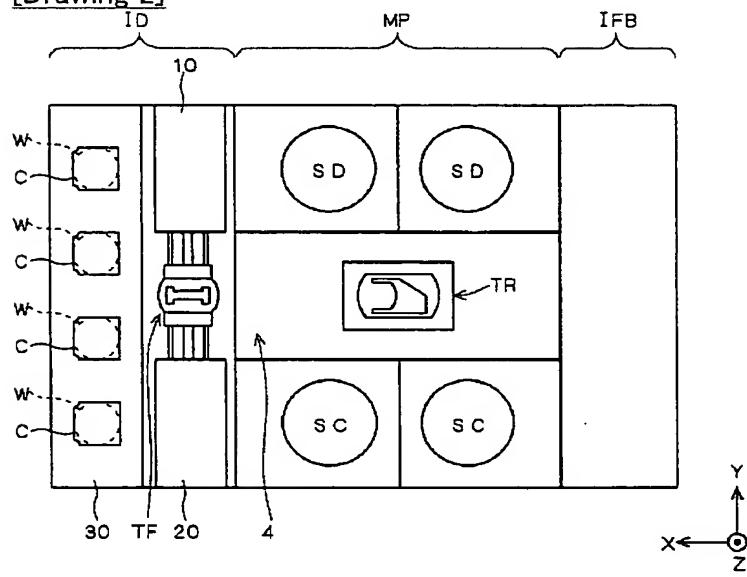
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DRAWINGS

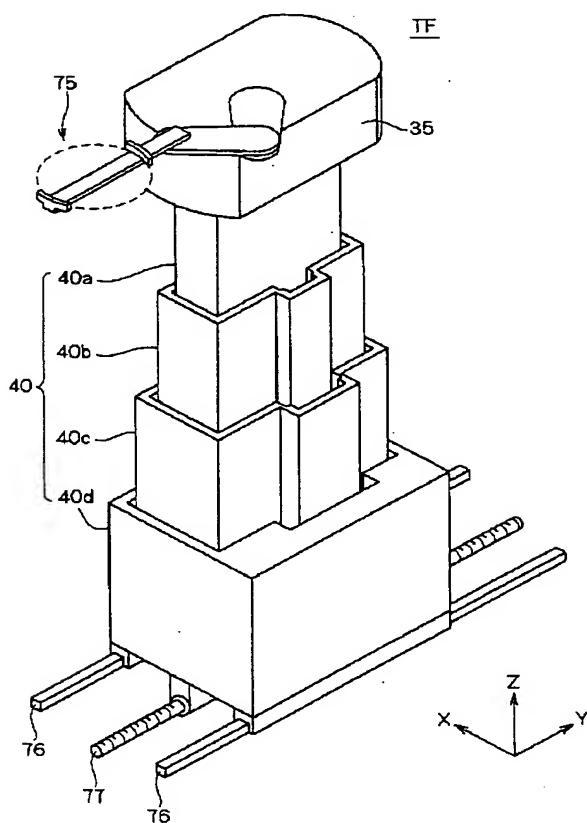
[Drawing 1]



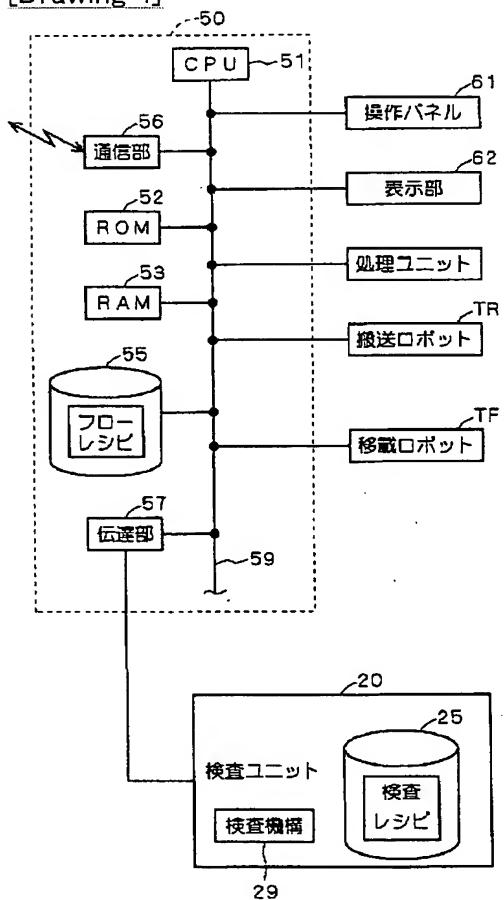
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Drawing 5]

検査レシピ N○. 3
検査レシピ N○. 2
検査レシピ N○. 1
検査ポイント XXXXXX
検査時間 XXXXXX
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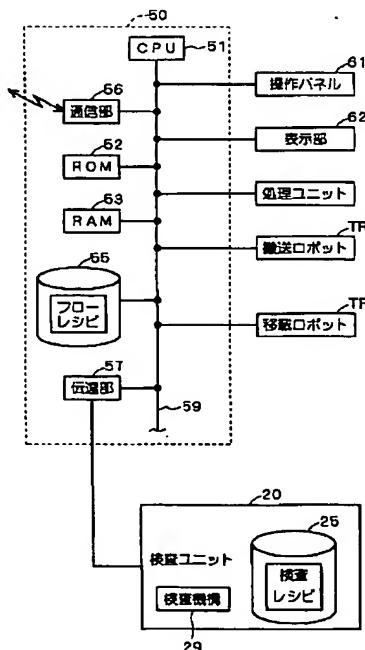
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(54)【発明の名称】 基板処理装置

(57)【要約】

【課題】 基板の検査に関する条件を容易に設定するこ
とができる基板処理装置を提供する。

【解決手段】 検査ユニット20の磁気ディスク25に
複数の検査レシピを保持している。複数の検査レシピの
それぞれには検査に関する異なる条件を記述するととも
に、それら複数の検査レシピのそれぞれに異なる固有の
番号(レシピ番号)を付けている。そして、いずれの検
査レシピを使用するかについては、複数の検査レシピの
いずれかに対応付けられたレシピ番号をオペレータが操
作パネル61から選択することができ、それによって検
査ユニット20での検査に関する条件を指定するこ
とができる。選択されたレシピ番号は、フローレシピに記述
され、伝達部57から検査ユニット20に伝達される。
検査ユニット20は、指定された検査レシピに従って検
査を実行する。



【特許請求の範囲】

【請求項1】 基板に所定の処理を行う処理部を備えた基板処理装置であって、
基板に対して所定の検査を行う検査部と、
前記検査部に対して基板を搬出入する搬出入手段と、
前記検査部での検査に関する条件を指定する指定手段
と、
前記搬出入手段が前記検査部に基板を搬入する前に、前記指定手段から指定された当該基板についての検査に関する条件を前記検査部に伝達する伝達手段と、を備えることを特徴とする基板処理装置。

【請求項2】 請求項1記載の基板処理装置において、
前記検査部は、検査に関する条件を記述した複数の検査レシピを保持し、

前記指定手段は、前記複数の検査レシピのいずれかを選択することによって検査に関する条件を指定することを特徴とする基板処理装置。

【請求項3】 請求項2記載の基板処理装置において、
前記複数の検査レシピには、異なるコードが対応付けられ、

前記指定手段は、前記複数の検査レシピのいずれかに対応付けられたコードを選択することによって検査に関する条件を指定することを特徴とする基板処理装置。

【請求項4】 請求項3記載の基板処理装置において、
前記指定手段によって選択されたコードは、基板の処理手順を記述したフローレシピに記述されることを特徴とする基板処理装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、半導体基板、液晶表示装置用ガラス基板、フォトマスク用ガラス基板、光ディスク用基板等（以下、単に「基板」と称する）に対して所定の検査、例えばレジストの膜厚測定等を行う検査部を組み込んだ基板処理装置に関する。

【0002】

【従来の技術】周知のように、半導体や液晶ディスプレイなどの製品は、上記基板に対して洗浄、レジスト塗布、露光、現像、エッチング、層間絶縁膜の形成、熱処理、ダイシングなどの一連の諸処理を施すことにより製造されている。かかる半導体製品等の品質維持のため、上記各種処理のまとまったプロセスの後に、基板の各種検査を行って品質確認を行うことが重要である。

【0003】例えば、レジスト塗布処理および現像処理を行う基板処理装置（いわゆるコータ&デベロッパ）においては、従来より現像処理の最終工程にて基板上のパターンの線幅測定等の検査を行うようになっていた。このときに、検査対象となる基板は一旦基板処理装置から搬出され、別位置に設けられた専用の検査装置に搬入されてから検査に供されることとなる。そして、その検査結果が基板処理装置にフィードバックされ、各種処理条件

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の調整が行われるのである。

【0004】

【背景となる技術】ところが、従来においては、基板処理装置と検査装置とが別に設けられていたために、検査対象となる基板を検査装置まで運搬しなければならず、時間および労力の無駄が生じていた。また、検査装置への搬入時間が必要であるとともに検査結果が判明するまでにある程度の時間を要していたため、ある基板についての検査結果が判明するまでに、当該基板よりも後に装置に払い出された基板の相当数の処理が終了していた。このため、検査結果に不具合があった場合には、相当数の基板について再処理を行う必要が生じ、処理効率が低下することとなっていた。

【0005】このような問題を解決するために、基板処理装置の内部に検査装置を組み込むことが検討されている。基板処理装置の内部に検査装置を組み込めば、基板処理装置の搬送ロボットによって検査装置に基板を搬送することができるため、無駄な搬送時間を省略することができ、短時間のうちに検査結果を判明させることができる。従って、検査結果に不具合があったとしても、再処理が必要な基板枚数を少なくすることができる。

【0006】

【発明が解決しようとする課題】しかしながら、従来においては、基板処理装置内に組み込んだ検査装置に検査条件を記述した複数のレシピを持たせ、如何なる条件によってどのような検査を行うかは検査装置側からのレシピ切り換えによって独自に行うようにしていた。すなわち、オペレータとしては基板処理装置からの基板処理条件等の設定とは別に検査装置の検査条件の設定を別個に行う必要があったのである。

【0007】このため、基板の検査効率が低下するとともに、操作ミス等が生じ易いという問題があった。

【0008】本発明は、上記課題に鑑みてなされたものであり、基板の検査に関する条件を容易に設定することができる基板処理装置を提供することを目的とする。

【0009】

【課題を解決するための手段】上記課題を解決するため、請求項1の発明は、基板に所定の処理を行う処理部を備えた基板処理装置であって、基板に対して所定の検査を行う検査部と、前記検査部に対して基板を搬出入する搬出入手段と、前記検査部での検査に関する条件を指定する指定手段と、前記搬出入手段が前記検査部に基板を搬入する前に、前記指定手段から指定された当該基板についての検査に関する条件を前記検査部に伝達する伝達手段と、を備えている。

【0010】また、請求項2の発明は、請求項1の発明に係る基板処理装置において、前記検査部に、検査に関する条件を記述した複数の検査レシピを保持させ、前記指定手段に、前記複数の検査レシピのいずれかを選択することによって検査に関する条件を指定させている。

【0011】また、請求項3の発明は、請求項2の発明に係る基板処理装置において、前記複数の検査レシピには、異なるコードが対応付けられ、前記指定手段に、前記複数の検査レシピのいずれかに対応付けられたコードを選択することによって検査に関する条件を指定させている。

【0012】また、請求項4の発明は、請求項3の発明に係る基板処理装置において、前記指定手段によって選択されたコードを、基板の処理手順を記述したフローレシピに記述している。

【0013】

【発明の実施の形態】以下、図面を参照しつつ本発明の実施の形態について詳細に説明する。

【0014】図1は、本発明に係る基板処理装置全体の概略を示す斜視図である。また、図2は、この基板処理装置の概略構成を示す平面図である。なお、図1、図2および図3にはそれらの方向関係を明確にするためにZ軸方向を鉛直方向とし、XY平面を水平面とするXYZ直交座標系を付している。この基板処理装置は、基板Wにレジスト塗布処理および現像処理を行う基板処理装置（いわゆるコータ&デベロッパ）であり、大別してインデクサIDとユニット配置部MPとインターフェイスIFBにより構成されている。

【0015】インデクサIDは、移載ロボットTF、検査ユニット10、20（検査部）および載置ステージ30を備えるとともに、インデクサIDの外壁面には表示部62が設置されている。載置ステージ30には、4つのキャリアCを水平方向（Y軸方向）に沿って配列して載置することができる。それぞれのキャリアCには、多段の収納溝が刻設されており、それぞれの溝には1枚の基板Wを水平姿勢にて（正面を水平面に沿わせて）収容することができる。従って、各キャリアCには、複数の基板W（例えば25枚）を水平姿勢かつ多段に所定の間隔を隔てて積層した状態にて収納することができる。なお、キャリアCの形態としては、基板Wを密閉空間に収納するFOUP(front opening unified pod)または、収納基板Wを外気に曝すOC(open cassette)のいずれであっても良い。

【0016】図3は、移載ロボットTFの外観斜視図である。移載ロボットTFは、伸縮体40の上部に1本の移載アーム75を備えたアームステージ35を設けるとともに、伸縮体40によってテレスコピック型の多段入れ子構造を実現している。

【0017】伸縮体40は、上から順に4つの分割体40a、40b、40c、40dによって構成されている。分割体40aは分割体40bに収容可能であり、分割体40bは分割体40cに収容可能であり、分割体40cは分割体40dに収容可能である。そして、分割体40a～40dを順次に収納していくことによって伸縮体40は収縮し、逆に分割体40a～40dを順次に引

き出していくことによって伸縮体40は伸張する。すなわち、伸縮体40の収縮時においては、分割体40aが分割体40bに収容され、分割体40bが分割体40cに収容され、分割体40cが分割体40dに収容される。一方、伸縮体40の伸張時においては、分割体40aが分割体40bから引き出され、分割体40bが分割体40cから引き出され、分割体40cが分割体40dから引き出される。

【0018】伸縮体40の伸縮動作は、その内部に設けられた伸縮昇降機構によって実現される。伸縮昇降機構としては、例えば、ベルトとローラとを複数組み合わせたものをモータによって駆動する機構を採用することができる。移載ロボットTFは、このような伸縮昇降機構によって移載アーム75の鉛直方向（Z軸方向）に沿った昇降動作を行うことができる。

【0019】また、図3に示すように、移載ロボットTFの搬送アーム75は、雄ねじ77、ガイドレール76等からなるY軸方向の駆動機構であるY駆動機構によってY軸方向に沿って移動することが可能となっている。すなわち、図外の電動モータによって雄ねじ77を回転させることにより、雄ねじ77に螺合する分割体40dをY軸方向に沿ってスライド移動させることができるのである。

【0020】さらに、移載ロボットTFは、移載アーム75の水平進退移動および回転動作を行うこともできる。具体的には、分割体40aの上部にアームステージ35が設けられており、そのアームステージ35によって移載アーム75の水平進退移動および回転動作を行う。すなわち、アームステージ35が移載アーム75のアームセグメントを屈伸させることにより移載アーム75が水平進退移動を行い、アームステージ35自体が伸縮体40に対して回転動作を行うことにより移載アーム75が回転動作を行う。

【0021】従って、移載ロボットTFは、移載アーム75を高さ方向に昇降動作させること、Y軸方向に沿って水平移動させること、回転動作させることおよび水平方向に進退移動させることができる。つまり、移載ロボットTFは、移載アーム75を3次元的に移動させることができるのである。

【0022】このような移載ロボットTFの動作により、インデクサIDは、複数の基板Wを収納可能なキャリアCから未処理の基板Wを取り出してユニット配置部MPに渡すとともに、ユニット配置部MPから処理済の基板Wを受け取ってキャリアCに収納することができる。また、インデクサIDは、移載ロボットTFによって検査ユニット10および検査ユニット20に対する基板Wの搬出入を行ふ。

【0023】検査ユニット10はマクロ欠陥検査を行う検査ユニット（マクロ欠陥検査ユニット）である。「マクロ欠陥検査」は、基板W上に現出した比較的大きな欠

陥、例えばパーティクルの付着の有無を判定する検査である。一方、検査ユニット20は、レジストの膜厚測定、パターンの線幅測定およびパターンの重ね合わせ測定を行う検査ユニットである。すなわち、検査ユニット20は、1つの検査ユニットで3種類の検査を行うことができる。 「レジストの膜厚測定」は、基板W上に塗布されたレジストの膜厚を測定する検査である。 「パターンの線幅測定」は、露光および現像処理によって基板W上に形成されたパターンの線幅を測定する検査である。 「パターンの重ね合わせ測定」は、露光および現像処理によって基板W上に形成されたパターンのズレを測定する検査である。

【0024】検査ユニット10および検査ユニット20はいずれもインデクサIDの内部の上側の両隅に配置されている。より正確には、上方から見たときに((−Z)向きに見たときに)、インデクサIDの中に検査ユニット10および検査ユニット20が完全に包含される関係となる。

【0025】ユニット配置部MPには、基板Wに所定の処理を行う処理ユニットが複数配置されている。すなわち、ユニット配置部MPの前面側(−Y側)には2つの塗布処理ユニットSCが配置されている。塗布処理ユニットSCは、基板Wを回転させつつその基板正面にフォトレジストを滴下することによって均一なレジスト塗布を行う、いわゆるスピンドルコータである。

【0026】また、ユニット配置部MPの背面側(+Y側)であって、塗布処理ユニットSCと同じ高さ位置には2つの現像処理ユニットSDが配置されている。現像処理ユニットSDは、露光後の基板W上に現像液を供給することによって現像処理を行う、いわゆるスピンドルコータである。塗布処理ユニットSCと現像処理ユニットSDとは搬送路4を挟んで対向配置されている。

【0027】2つの塗布処理ユニットSCおよび2つの現像処理ユニットSDのそれぞれの上方には、図示を省略するファンフィルタユニットを挟んで熱処理ユニット群5が配置されている(図示の便宜上、図2では熱処理ユニット群5を省略)。熱処理ユニット群5には、基板Wを加熱して所定の温度にまで昇温するいわゆるホットプレートおよび基板Wを冷却して所定の温度にまで降温するとともに該基板Wを当該所定の温度に維持するいわゆるクールプレートが組み込まれている。なお、ホットプレートには、レジスト塗布処理前の基板に密着強化処理を行う密着強化ユニットや露光後の基板のベーク処理を行う露光後ベークユニットが含まれる。本明細書では、ホットプレートおよびクールプレートを総称して熱処理ユニットとし、塗布処理ユニットSC、現像処理ユニットSDおよび熱処理ユニットを総称して処理ユニット(処理部)とする。

【0028】塗布処理ユニットSCと現像処理ユニットSDとの間に挟まれた搬送路4には搬送ロボットTRが

配置されている。搬送ロボットTRは、2つの搬送アームを備えており、移載ロボットTFと同様の機構により、その搬送アームを鉛直方向に沿って昇降させることと、水平面内で回転させることと、水平面内にて進退運動を行わせることができる。これにより、搬送ロボットTRはユニット配置部MPに配置された各処理ユニットの間で基板Wを所定の処理手順にしたがって循環搬送することができる。また、搬送ロボットTRは、インデクサIDの移載ロボットTFおよびインターフェイスIFBとの間でも基板Wの受け渡しを行うことができる。

【0029】インターフェイスIFBは、レジスト塗布処理済の基板Wをユニット配置部MPから受け取って図外の露光装置(ステッパー)に渡すとともに、露光後の基板Wを該露光装置から受け取ってユニット配置部MPに戻す機能を有する。この機能を実現するためにインターフェイスIFBには基板Wの受け渡しを行うための受け渡しロボット(図示省略)が配置されている。また、インターフェイスIFBにはユニット配置部MPでの処理時間と露光装置での処理時間との差を解消するために基板Wを一時収納するバッファ部も設けられている。

【0030】図4は、上記基板処理装置の制御機構を説明するための機能ブロック図である。基板処理装置は、その内部に装置全体を制御するための制御部50を備えている。制御部50は、コンピュータによって構成されており、その本体部であって演算処理を行うCPU51と、読み出し専用メモリーであるROM52と、読み書き自在のメモリーであるRAM53と、制御用ソフトウェアやデータなどを記憶しておく磁気ディスク55と、基板処理装置の外部に設けられているホストコンピュータなどと通信を行う通信部56と、検査ユニット10、20にレシピ番号を通知するインターフェイスである伝達部57を備えている。CPU51と磁気ディスク55や伝達部57等とはバスライン59を介して電気的に接続されている。また、制御部50のバスライン59には、基板処理装置の操作パネル61、表示部62、処理ユニット、搬送ロボットTRおよび移載ロボットTF等も電気的に接続されている。処理部ユニット、搬送ロボットTR、移載ロボットTFについては上述した通りである。

【0031】操作パネル61は、基板処理装置の外壁面に設けられたキーボード等によって構成されている。表示部62は、操作パネル61に併設されたディスプレイである。オペレータは、表示部62に表示された内容を確認しつつ、操作パネル61からコマンドやパラメータ等を入力することができる。なお、操作パネル61と表示部62とをタッチパネルとして一体に構成するようにしても良い。

【0032】また、オペレータは、操作パネル61から基板処理の手順を記述したフローレシピを設定入力することができる。入力されたフローレシピは、磁気ディス

ク55に記憶される。制御部50のCPU51は、磁気ディスク55に記憶されているフローレシビに従って搬送ロボットTRおよび移載ロボットTFを制御し、該フローレシビに記述された処理手順に沿って基板Wを搬送させる。さらに、オペレータは操作パネル61から後述するレシビ番号を設定入力することもできる。

【0033】また、検査ユニット20は、基板Wに対して光学的な検査を行うための検査機構29と、磁気ディスク25を内蔵している。磁気ディスク25には、検査機構29を動作させるための処理プログラムの他、検査に関する条件を記述した複数の検査レシビが格納されている。なお、図4では図示を省略しているが、検査ユニット10についても検査ユニット20と同様の構成とされている。

【0034】図5は、検査ユニット20が保持する複数の検査レシビを示す図である。それぞれの検査レシビには、検査に関する条件、例えば検査を行うべき基板W上*

ステップ	搬送先	レシビ番号
1	ホットプレート	
2	クールプレート	
3	塗布処理ユニット	
4	ホットプレート	
5	クールプレート	
6	露光装置	
7	ホットプレート	
8	クールプレート	
9	現像処理ユニット	
10	ホットプレート	
11	クールプレート	
12	検査ユニット	No. 2
13	インデクサ	

【0037】このようなフローレシビは、オペレータによって操作パネル61から制御部50に設定入力されるものである。また、基板処理装置外のホストコンピュータから通信部56を介して制御部50に表1の如きフローレシビを送信するようにしても良い。いずれであっても、設定入力されたフローレシビは制御部50の磁気ディスク55に記憶される。フローレシビの設定入力に際して、基板Wの搬送先に検査ユニット10または検査ユニット20が含まれている場合は、オペレータがその検査ユニットで使用するレシビ番号を操作パネル61から選択・指定する。選択されたレシビ番号は、ステップ12の搬送先「検査ユニット」に対応付けられてフローレシビに記述される。表1では、レシビ番号として「No. 2」が記述されている。そして、表1のフローレシビに従って基板を順次搬送するように、CPU41が搬

*の位置である「検査ポイント」や「検査時間」等が記述されている。また、検査ユニット20の如く複数種類の検査を行うことができる場合には、どの検査を行うかも検査レシビに記述されている。複数の検査レシビのそれぞれには異なるレシビ番号が付けられている。検査ユニット20は、複数の検査レシビのうちのいずれかに記述された検査条件に従って基板Wに対する検査を実行する。

【0035】次に、上記構成を有する基板処理装置における処理について説明する。基板処理は、制御部50のCPU51が磁気ディスク55に記憶されているフローレシビに従って搬送ロボットTRおよび移載ロボットTFを制御することにより進行される。次の表1にフローレシビの一例を示す。

【0036】
【表1】

送ロボットTRおよび移載ロボットTFを制御する。
【0038】まず、インデクサIDの移載ロボットTFが未処理の基板WをキャリアCから取り出して、ユニット配置部MPの搬送ロボットTRに渡す。未処理の基板Wを取り出すときには、該基板Wを収納したキャリアCの正面に移載ロボットTFが移動し、移載アーム75を基板Wの下方に差し入れる。そして、移載ロボットTFは、移載アーム75を若干上昇させて基板Wを保持し、移載アーム75を退出させることによって未処理の基板Wを取り出す。

【0039】ユニット配置部MPに渡された基板Wは、表1のフローレシビに従って搬送ロボットTRにより各処理ユニット間で循環搬送され、順次処理が行われる。すなわち、ホットプレートにて密着強化処理（ステップ1）を行った基板Wをクールプレートに搬送して冷却処

理（ステップ2）を行った後、塗布処理ユニットSCに搬送してレジスト塗布処理（ステップ3）を行う。その後、レジストが塗布された基板Wをホットプレートに搬送してプリベーク処理（ステップ4）を行った後、クールプレートに搬送して冷却処理（ステップ5）を行いレジスト膜を形成する。レジスト膜が形成された基板WはインターフェイスIFBを介して露光装置に渡され、バターンの露光処理（ステップ6）が行われる。

【0040】露光処理が終了した基板Wは露光装置からインターフェイスIFBを介して再びユニット配置部MPに戻される。露光後の基板Wに対してはホットプレートに搬送して露光後ベーク処理（ステップ7）を行い、クールプレートにて冷却処理（ステップ8）を行った後、現像処理ユニットSDに搬送して現像処理（ステップ9）を行う。現像処理が終了した基板Wは、さらにホットプレートにてベーク処理（ステップ10）およびクールプレートにて冷却処理（ステップ11）が行われた後、ユニット配置部MPの搬送ロボットTRからインデクサIDの移載ロボットTFに渡される。基板Wを受け取った移載ロボットTFは、その基板Wを検査ユニット20に搬送する（ステップ12）。本実施形態では、基板Wに検査としてバターンの線幅測定を行う。検査終了後の基板Wは、移載ロボットTFによって検査ユニット20から取り出されてキャリアCに収納される（ステップ13）。

【0041】ここで、基板Wに対する検査の内容はバターンの線幅測定に限定されるものではなく、検査を行う段階も最終の冷却処理（ステップ11）終了後に限定されるものではない。例えば、各種検査のうちレジストの膜厚測定はプリベーク後の露光装置に搬入する前の基板Wに対して行うのが好ましい。この場合、プリベーク処理が終了した基板Wを一旦ユニット配置部MPからインデクサIDに戻し、移載ロボットTFが該基板Wを検査ユニット20に搬入する。レジストの膜厚測定が終了した基板Wは移載ロボットTFによって検査ユニット20から再びユニット配置部MPに渡され、ユニット配置部MPの搬送ロボットTRからインターフェイスIFBに渡され、露光装置に搬入されることとなる。

【0042】また、マクロ欠陥検査およびバターンの重ね合わせ測定については、上記のバターンの線幅測定と同様に、全ての処理が終了してインデクサIDに戻ってきた基板Wに対して行うのが好ましい。マクロ欠陥検査については、全ての処理が終了してインデクサIDに戻ってきた基板Wを移載ロボットTFが検査ユニット10に搬入して行うようにする。一方、バターンの重ね合わせ測定については、全ての処理が終了してインデクサIDに戻ってきた基板Wを移載ロボットTFが検査ユニット20に搬入して行うようにする。いずれの場合も、検査が終了した基板Wは検査ユニット10または検査ユニット20から移載ロボットTFによってキャリアCに收

納される。

【0043】以上のような、基板Wをいずれの検査ユニットにどの段階にて搬送するかは、フローレシビによって自由に設定することができる。従って、例えば全ての処理前に検査を行うことも、2種類以上の検査を行うように行なうこともフローレシビにその旨を記述することによって自由に設定することができる。そして、設定されたフローレシビに従って基板を順次搬送するように、CPU41が搬送ロボットTRを制御することにより、種々のバターンの検査が実現される。従って、基板検査の自由度が高くなり、効率良く基板の検査を行うことができる。

【0044】ところで、検査ユニット20に搬入された基板Wにどのような条件にて検査を行うかはいずれの検査レシビに従って検査を実行するかによって定まる。上述した例では、オペレータが操作パネル61からレシビ番号「N0.2」を選択し、そのレシビ番号がフローレシビ（表1）に記述されている。フローレシビに従って制御を行っている制御部50の伝達部57は、移載ロボットTFが検査ユニット20に基板を搬入する前に、当該基板について選択されているレシビ番号が「N0.2」であることを伝達する。そして、検査ユニット20はレシビ番号N0.2の検査レシビに記述された条件にて当該基板に検査を実行するのである。

【0045】すなわち、本実施形態では、複数の検査レシビのそれぞれに検査に関する異なる条件を記述するとともに、それら複数の検査レシビのそれぞれに異なる固有の番号（レシビ番号）を対応付けている。なお、検査レシビ自体は検査ユニット20に保持させている。そして、いずれの検査レシビを使用するかについては、複数の検査レシビのいずれかに対応付けられたレシビ番号をオペレータが操作パネル61から選択することができ、それによって検査ユニット20での検査に関する条件を指定することができる。選択されたレシビ番号は、フローレシビに記述され、フローレシビに従った制御を行う制御部50の伝達部57から検査ユニット20に伝達される。検査ユニット20では、選択されたレシビ番号に対応付けられた検査レシビに従って基板の検査を行う。つまり、フローレシビにレシビ番号を記述することによって、検査レシビとフローレシビとのひも付けを行っているのである。

【0046】このようにすれば、オペレータはフローレシビの入力時にレシビ番号の選択をも併せて行うことにより、基板処理装置側から検査レシビの選択を行うことができ、基板の検査に関する条件を容易に設定することができる。従って、基板Wの検査効率を向上することができるとともに、操作ミス等を防止することもできる。なお、検査ユニット10についても同様にして検査レシビが選択される。

【0047】以上、本発明の実施の形態について説明し

たが、この発明は上記の例に限定されるものではない。例えば、上記実施形態においては、操作パネル61から選択されたレシピ番号をフローレシピに記述することによって、いわゆるひも付けを行うようになっていたが、これに限定されるものではなく、操作パネル61から選択されたレシピ番号を基板Wが検査ユニットに搬入されるタイミングに合わせて伝達部57から検査ユニットに直接伝達するようにしても良い。

【0048】また、レシピ番号に代えて、アルファベットや記号等の識別機能を有するコードを使用するようにしても良い。この場合、操作パネル61からコードを選択することによって検査ユニットで使用する検査レシピが決定され、検査に関する条件が指定されるのである。

【0049】すなわち、基板処理装置の側から検査ユニットで使用する検査レシピを指定できるような形態であれば種々の手法を採用することができる。

【0050】また、上記実施形態においては、2つの検査ユニット（検査ユニット10および検査ユニット20）をインデクサIDの内部に配置するようになっていたが、これに限定されるものではなく、検査ユニットは1つであっても良いし、2つ以上であっても良い。また、検査ユニットの配置位置もインデクサIDの内部に限定されるものではなく、ユニット配置部MPやインターフェイスIFBの内部であっても良いし、基板処理装置の外部に付設するようにしても良い。そして、各検査ユニットは、レジストの膜厚を測定する膜厚測定、パターンの線幅を測定する線幅測定、パターンの重ね合わせを測定する重ね合わせ測定およびマクロ欠陥検査のうちの少なくとも1種類以上の検査を行う検査ユニットとすれば良い。

【0051】また、上記実施形態においては、インデクサIDの移載ロボットTFに1本の移載アームを備えるいわゆるシングルアームとしていたが、2本の移載アームを備えるいわゆるダブルアームの形態としても良い。インデクサIDに検査ユニットを備えると、従来よりも当然に移載ロボットTFのアクセス頻度が多くなるため、2本の移載アームを備える移載ロボットTFの方が、基板Wの搬送効率が向上し、基板処理装置のスループットが向上する。

【0052】また、上記実施形態においては、基板処理装置を基板にレジスト塗布処理および現像処理を行う装置とし、検査ユニットの機能はいわゆるフォトリソグラフィに関連する検査を行う形態としていたが、本発明にかかる技術はこれに限定されるものではない。例えば、検査ユニットとしてはアミンまたはアンモニア濃度を測定する検査機能を備えたものを採用するようにしても良い。また、基板に付着したパーティクル等を除去する基板処理装置（いわゆるスピニスクラバ等）にパーティクル検査を行う検査ユニットを配置するようにしても良い。また、基板にSOD(Spin-on-Dielectronics)を塗

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布して層間絶縁膜を形成する装置に、その層間絶縁膜の焼成状態を検査する検査ユニットを配置するようにしても良い。さらに、他の基板処理装置にて処理された基板を搬入して、その検査を行った後に検査結果を処理条件にフィードフォワードするような基板処理装置に検査ユニットを配置するようにしても良い。いずれの場合であっても、操作パネル61からレシピ番号を選択することによって検査ユニットで使用する検査レシピを指定することにより、基板処理装置側から検査レシピの選択を行うことができ、基板の検査に関する条件を容易に設定することができる。

【0053】

【発明の効果】以上、説明したように、請求項1の発明によれば、搬出手段が検査部に基板を搬入する前に、指定手段から指定された当該基板についての検査に関する条件を検査部に伝達するため、基板処理装置側から検査に関する条件を指定することができ、基板の検査に関する条件を容易に設定することができる。

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【0054】また、請求項2の発明によれば、検査部が検査に関する条件を記述した複数の検査レシピを保持し、指定手段は、複数の検査レシピのいずれかを選択することによって検査に関する条件を指定するため、検査レシピを介して基板の検査に関する条件を容易に設定することができる。

【0055】また、請求項3の発明によれば、複数の検査レシピには異なるコードが対応付けられ、指定手段は、複数の検査レシピのいずれかに対応付けられたコードを選択することによって検査に関する条件を指定するため、検査レシピの指定を容易に行うことができる。

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【0056】また、請求項4の発明によれば、指定手段によって選択されたコードが基板の処理手順を記述したフローレシピに記述されるため、基板処理装置側から検査に関する条件を確実に指定することができ、基板の検査に関する条件を容易に設定することができる。

【図面の簡単な説明】

【図1】本発明に係る基板処理装置全体の概略を示す斜視図である。

【図2】図1の基板処理装置の概略構成を示す平面図である。

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【図3】移載ロボットの外観斜視図である。

【図4】基板処理装置の制御機構を説明するための機能ブロック図である。

【図5】検査ユニットが保持する複数の検査レシピを示す図である。

【符号の説明】

1 基板処理装置

10, 20 検査ユニット

50 制御部

57 伝達部

50 61 操作パネル

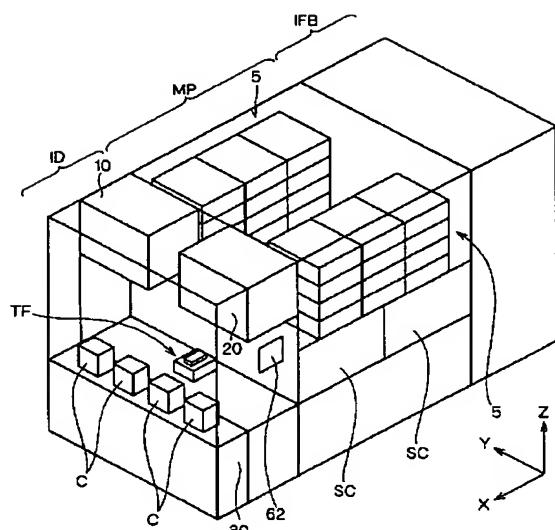
13

14

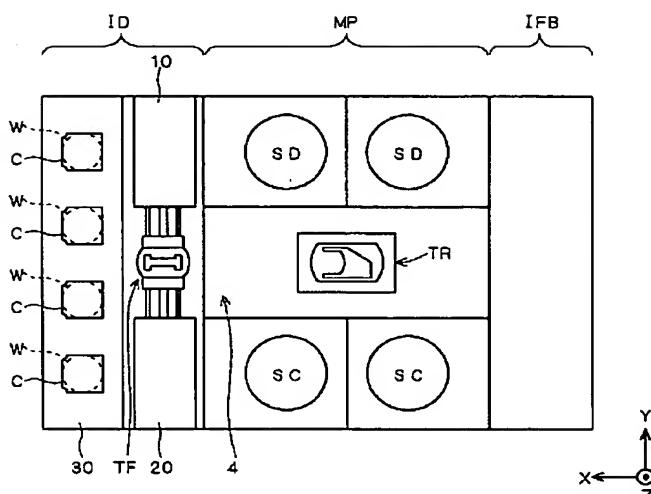
TF 移載ロボット
SC 塗布処理ユニット

* SD 現像処理ユニット

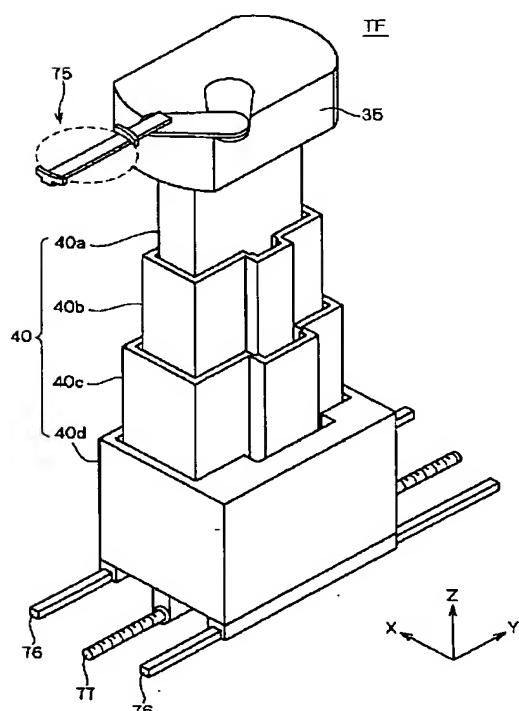
(图 1)



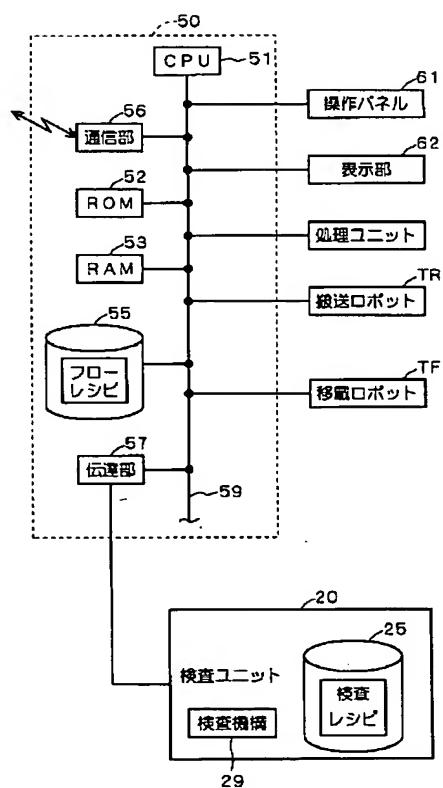
【图2】



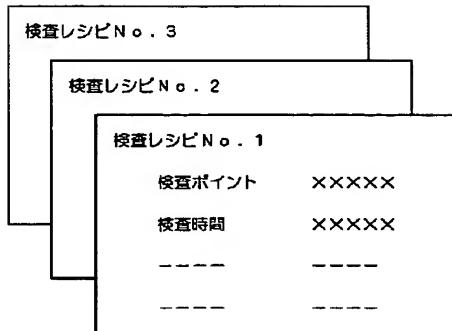
[図3]



[図4]



【図5】



フロントページの続き

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